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CORRELATES OF WEIGHT LOSS IN TREATMENT AND AT FOLLOW-UP

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SUMMARY

Problem

Despite the perennial concern about weight reduction, the goal of losing weight and maintaining a weight loss remains an elusive one for most individuals. The U.S. Navy has become increasingly more involved in the implementation of effective weight reduction programs not only because of the necessity for maintaining high levels of health and physical fitness established for all active duty personnel but also because of its responsibility to provide health care for retirees and dependents. Obesity has been linked with at least eight specific disorders, the consequences of which are an increased likelihood of ill health among the obese and a corresponding decrease in naval readiness, a heavier work load for Navy physicians, and the added responsibility among health care specialists for developing and conducting weight reduction programs.

Objectives

The purpose of this longitudinal study was (1) to evaluate the effectiveness of a Navy-sponsored weight reduction program in helping participants lose weight and maintain the weight loss during a one-year follow-up and (2) to identify variables predictive of success during treatment and throughout the follow-up period.

Approach

Participants included 268 active duty or retired naval men and 923 women (nearly all of whom were spouses of naval personnel) enrolled in a Navy-sponsored weight reduction program. After a one-year follow-up, an evaluation form was mailed to all participants, except for 200 individuals who could not be located. Responses to the survey (686 participants or 58% returned the questionnaire) were used to create three criteria: the ratio of weight loss to desired weight loss goal during the program, the ratio of pounds lost in the program and during follow-up minus pounds gained divided by desired weight loss goal, and a rating of success from 1 to 4, with 1 representing "didn't really diet" to 4 for achieving the weight loss goal. Nine composites of items from the pretreatment and follow-up questionnaires were used as predictors of the three criteria after dividing the sample into validation and cross-validation subsamples.

Results

Results of this study demonstrated that the Navy-sponsored weight reduction program was quite successful in helping participants lose weight; the mean weight loss was 22 pounds for women and 28 pounds for men. By the end of follow-up, 32% of the women and 29% of the men responded that they had not gained weight.

In predicting the ratio of weight loss achieved to desired weight loss during treatment, the strongest correlates among the nine composites included a self-reported improvement in health status while dieting, a history of few attempts at dieting, and adult onset of obesity. For the two criteria of one-year weight loss maintenance, the successful maintainer was characterized as having: (1) adaptively altered his or her eating behaviors, (2) experienced few adverse health changes or negative feelings while dieting, (3) become overweight during adulthood, and (4) engaged in some form of physical exercise.

Conclusions

Results showed that to maintain a weight loss over the long term, appropriate eating behaviors must permanently replace inappropriate ones. Second, individuals who reported an improvement in health status and few negative feelings while dieting had a greater likelihood than others of achieving and maintaining their weight loss goal. Third, the experiencing of few dieting attempts was associated with weight loss achievement and maintenance. Other results suggested that childhood onset of obesity tends to predestine individuals to an adulthood of weight control problems. Fifth, because obesity is caused by an imbalance in the number of calories ingested and the number expended, most diet regimens are enhanced by a properly tailored exercise program.

Recommendations

Weight reduction programs need to be identified that guarantee a higher probability of success than that reported for most programs. A successful long-term change in one's eating behaviors requires a systematic introduction of competitive, nonfood-related reinforcers that hold significance for the dieter to first bridge the gap and then slowly fill it. Efficacious, cost-effective, individualized intervention procedures suitable for group settings in both the military and nonmilitary communities must be developed that incorporate an exercise regimen and promote the adoption of a long-term nutritionally sound eating program.

Correlates of Weight Loss in Treatment and at Follow-up

In the United States alone, estimates indicate that as many as 80 million men, women, and children are overweight (Stuart & Davis, 1972). Evidence published by the American Medical Association (1978), moreover, has shown that American men and women on the average significantly increased their weights from the 1960s to the 1970s. Several organizations and agencies (e.g., American Medical Association and American Heart Association) have persisted in cautioning the American public about the increased health risks related to obesity, warnings that are based on the results of hundreds of research projects. Rimm and his associates (1975), for example, identified eight specific diseases associated with obesity among women: diabetes mellitus, hypertension, gallbladder disease, gout, thyroid disease, heart disease, arthritis, and jaundice. For most obese individuals, however, the primary consideration is how to permanently lose excess weight which as an end result then would be expected to enhance their health, appearance, and freedom of movement.

Despite the perennial concern about weight reduction, the goal of losing weight and maintaining a weight loss remains an elusive one for most individuals. In an early review of the weight reduction literature, Stunkard and McLaren-Hume (1959) compared success rates of various programs and concluded that, overall, 25% of grossly overweight individuals lost 20 pounds (9.1 kg) and only 5% were able to lose 40 pounds (18.1 kg). Stunkard (1958) summarized the pessimistic view of many professionals in weight control research and health care delivery: "Most obese persons will not stay in treatment for obesity. Of those who stay in treatment, most will not lose weight and, of those who do lose weight, most will regain it."

In the ensuing two decades, the prognosis for the typical weight loser changed little; in fact, Mann (1974) concluded that obesity is a relatively incurable disorder. This dire pronouncement, however, has had no impact on the publication of diet books nor the establishment of diet treatment centers. The hopeful dieter, in turn, typically selects a program on the basis of considerable optimism but with scant knowledge of his or her chances for success. In general, the treatment of this disorder in the long-term has been ineffective and the identification of predictors of success in a weight reduction program and at follow-up has proven to be of limited value except to underscore the importance of age at onset and external cues.

One promising development in the field of weight control is the self-help group. The group approach offers many advantages such as a practical and economic use of a given diet program's resources as well as the provision of opportunities for modeling, social support, group identification, reinforcement, peer pressure, and social intercourse. Examples of such groups are Weight Watchers, Overeaters Anonymous, TOPS (Take Off Pounds Sensibly), and KOPS (Keep Off Pounds Sensibly). In assessing the effectiveness of these programs, investigators report TOPS as comparable to other weight reduction methods and, in some comparisons, more effective (Wagonfeld & Wolowitz, 1968; Stunkard et al., 1970). Stunkard et al. (1970) report that among 22 chapters of TOPS between 10% and 62% of the members lost a total of 20 pounds (9.1 kg). In addition to the major components of group identification and peer support, TOPS' members can join the elite subgroup of KOPS after reaching their desired weight goal. The prospect of KOPS membership affords an additional impetus to succeed. Another weight loss maintenance incentive is the possibility of being employed by the weight control organization. Bender and Bender (1976) studied 215 members of Weight Watchers who became lecturers for the organization after achieving their weight loss goals. More than 90% controlled their weight within 10 pounds (4.5 kg) of their original goals for periods of 1 to 6 years. This highly successful record was attributed to continued Weight Watchers participation and concurrent peer support and scrutiny. As another example of a self-help group, Overeaters Anonymous, which uses a format similar to Alcoholics Anonymous, has been particularly successful in treating those obese persons characterized as "psychologically addicted to food" (Linder, 1974).

Results of other studies, however, have identified some shortcomings in self-help groups. Garb and Stunkard (1974) and Levitz and Stunkard (1974), for example, report that TOPS has a high attrition rate which, unless augmented with behavioral techniques, renders this approach relatively ineffective for the majority of members. In accord with this statement, Wilson and Brownell (1980) conclude that behavior modification weight loss programs are superior to traditional treatments. Most behavioral programs report an average weight loss of 11 pounds (5.0 kg) during 10 to 12 weeks of treatment (Wing & Jeffery, 1979).

The success rate of a particular weight loss program is measured by both the weight loss achieved during treatment and the subsequent maintenance of the loss at follow-up. While many studies, such as those cited above, report favorable weight losses, long-term maintenance data are frequently absent. Recently, however, Foreyt et al. (1982) have demonstrated that 43% of participants in a behavioral weight loss program remained at their new weights and 30% continued to lose throughout the one-year follow-up.

The U.S. Navy is concerned about the effectiveness of weight reduction programs not only because of the necessity for maintaining high levels of health and physical fitness established for all active duty personnel but also because of its responsibility to provide health care for retirees and dependents. In order to assure adherence to these physical and health standards, the Navy and all other branches of the military have developed and implemented physical fitness and weight reduction programs. Also of critical importance is the issue of the most prudent utilization of a limited pool of Navy physicians. As noted at the outset, obesity has been linked with at least eight specific disorders, the consequences of which are an increased likelihood of ill health among the obese, a heavier work load for Navy physicians, and the added responsibility among health care specialists for developing and conducting weight reduction programs.

The purpose of this study was (1) to evaluate the effectiveness of a Navy-sponsored weight reduction program in helping participants lose weight and maintain the weight loss during a one-year follow-up and (2) to identify variables predictive of success during treatment and throughout the follow-up period. To accomplish this objective, the study was divided into the following three phases. The first phase was designed to determine how many men and women lost weight during the program and how many maintained their weight loss during the follow-up period. The second phase consisted of developing composites of questionnaire items to be used as predictors of both weight loss and maintenance of the loss. The third phase was designed to examine the value of these composites as predictors of three criteria: (1) the ratio of desired weight loss achieved during the weight reduction program, (2) the extent of success in maintaining the weight loss during the follow-up, and (3) a rating (from 1 to 4) of the individual's degree of success throughout the program and follow-up period.

METHOD

Participants

The sample for this longitudinal study consisted of 268 men and 923 women who were participants during an 18-month period in a weight reduction program sponsored by the Navy. The male subsample included both active duty and retired naval personnel while nearly all of the women were spouses of active duty or retired personnel. The average age of the groups was 33.6 (S.D. 13.5) for men and 36.5 for women (S.D. = 13.5).

Beginning classes for this program were held three times a week. During these sessions, a Navy medical officer discussed the diet; recorded weights, heights, skinfold measures, and blood pressure values, and drew blood samples for subsequent laboratory analyses of lipids and cholesterol. The diet selected for this program limited the daily caloric intake to 1,000 kcals and utilized the low carbohydrate scheme characteristic of ketogenic diets (Kewick & Pawan, 1956; Atkins, 1972; Blackburn et al., 1973; Council on Foods and Nutrition, 1973). By limiting amounts of ingested carbohydrate, the body's cells do not receive adequate amounts of glucose and, therefore, begin to burn fat as an energy source. When doing so, waste acid products known as ketones are produced. Participants were given Ketosticks to test

their urines; a deep purple color indicated an individual was excreting ketones. After the diet forms were distributed and measurements recorded, participants completed an eating behaviors questionnaire which was developed by the senior author to obtain information concerning age of onset of weight problems, eating behaviors (including degree of external cue-elicited eating behaviors), physical activities, feelings about food and dieting, and emotions associated with eating.

After the initial session discussion groups were conducted twice a week to provide participants with a forum for supporting weight loss efforts, monitoring blood pressure and weight, sharing thoughts about the program and being overweight, discussing medical complications associated with obesity, and promoting self-control techniques. These group meetings generally were informal and well attended.

After a follow-up period of at least one year, an evaluation form was mailed to all participants for whom addresses were available. Throughout the 18-month follow-up data collection phase, approximately 200 individuals could not be located and thus were excluded from the study. In an effort to increase the return rate, participants were telephoned and asked to help evaluate the effectiveness of the program by completing and returning the questionnaire. A second telephone call was made if the participant had not returned the questionnaire in two weeks. Of the 1,191 individuals who began the program, 686 (58%) returned the questionnaire and 505 did not complete the survey or were not located. Results of comparative analyses revealed no significant differences on mean initial weights and desired weight loss goals between men and women who returned the questionnaire and those who could not be located or failed to respond to the follow-up query. The mean initial weights for women were 188.7 for follow-up respondents and 190.9 for nonparticipants while the mean weights for men were 235.8 and 238.4, respectively. The mean desired weight losses were approximately 55 pounds for men and 60 for women. Questions on the survey pertained to achievement of the weight loss goal, number of pounds lost during the program, feelings experienced while on the weight reduction regimen, changes in health status and eating behavior, reason(s) for discontinuing, extent of physical activities, and a rating of one's appearance.

Procedure

For the first phase of the analyses, frequency and percentage distributions were computed for the follow-up, self-reported questionnaire to determine how many men and women lost weight during the weight reduction program and how many maintained the loss throughout the follow-up period. Also computed were the average number of weeks in the program and a frequency distribution of the various reasons for discontinuing the regimen. Using responses to the follow-up questionnaire items, three criteria were created for each participant: (1) the ratio of weight loss to desired weight loss goal during the program; (2) the ratio of pounds lost in the program plus pounds lost during follow-up minus pounds gained divided by desired weight loss goal; and (3) a rating of success from 1 to 4 (with 1 representing "didn't really diet," 2 for achieved goal or lost weight but gained more than 50% back, 3 for achieved goal or lost weight but gained less than 50% back, and 4 for achieved goal with no subsequent gain or continued to progress toward the original goal without gaining weight).

For the second phase, composites of items from the pretreatment and follow-up questionnaires were created using item-analytic techniques and then the internal consistency (coefficient alpha) of each dimension was estimated. Development of four of the composites from the pretreatment eating behaviors questionnaire is described elsewhere (Rohlberg et al., 1980); the four factors were labeled Overweight History, Food Obsession, Emotional Eater, and Activities (physical). Five other scales evolved from the item and scale analytic procedures conducted on the pretreatment and follow-up questionnaire items. These included: Change in Eating Behaviors, Change in Health Status, History of Dieting (pretreatment survey), Feelings while Dieting, and Motivation to Diet (both questionnaires). Table 1 is a presentation of the nine composites and one item selected as an example of that specific dimension.

The nine composites were correlated with the three criteria developed in the third phase of this study. The sample of men and women with complete follow-up information (n = 686) was divided into validation and cross-validation subsamples.

The basis for this division was the degree of success achieved during the program and throughout the follow-up period; therefore, both subsamples included equal numbers of men and women for each specific level of success. Multiple regression analyses were then performed on the validation subsample, using as predictors the nine composites of items created from the pretreatment eating behaviors and follow-up questionnaires. The stepwise equations obtained from these analyses were applied to the cross-validation subsample. Results of these analyses will identify variables and equations that can be used experimentally to predict success in future studies of weight reduction and weight loss maintenance.

Table 1. Selected Items for Each of Nine Composites Used as Predictors of Obesity, Weight Reduction, and Weight Loss Maintenance

	Criteria			
Composite	Obesity	Program Weight Loss	Follow-up Weight Loss	Overall Success Rating
Overweight History	X	X	X	n.s.
Were you overweight between the ages of 7 and 12? (Yes or No)				
Food Obsession	X	n.s.	n.s.	n.s.
Sometimes I feel quite helpless and can't seem to control my eating behavior. (T or F)				
Emotional Eater	X	n.s.	n.s.	n s.
When you feel as though you have to eat something between meals, how would you describe your feelings? Depressed? (T or F)				
Activities	X	n.s.	n.s.	X
How many hours a week do you spend in some form of quite strenuous activity, such as swimming, jogging, handball, etc.?				
Change in Eating Behaviors	N/A	n.s.	X	X
Have you changed any of your eating habits? If yes, how?				
Change in Health Status	N/A	X	X	n.s.
Since you've been on the diet, have you noticed any changes in your health? If yes, what?				
History of Dieting	N/A	X	n.s.	n.s.
Since you were 17 years old, have you ever been on a diet? For example, I have taken doctor-prescribed weight reduction pills. (T or F)				
Feelings while Dieting	N/A	n.s.	n.s.	X
When you were participating in the program, how would you describe your feelings? Irritable? (T or F)				
Motivation to Diet	N/A	n.s.	n.s.	n.s.
Why did you join a weight-reduction program?				

RESULTS

Achievement of Weight Loss Goal and Maintenance

At the outset of the program, participants indicated the amount of weight they hoped to lose. Of those who returned the questionnaire, 14% of the women and 24% of the men responded that they had achieved their weight loss goals while participating in the weight reduction program. Among women, the reported weight loss ranged from 0 to 95 pounds (0-43.1 kg), with a mean of 22 pounds or 9.6 kg. For men, the reported weight loss during the program was from 0 to 166 pounds (0-75.3 kg), with a mean weight loss of 28 pounds or 12.7 kg. By the end of the one-year follow-up, 32% of the women and 29% of the men reported not having gained any weight; these percentages included participants who had not yet achieved their ideal weight but were progressing toward that goal. The remainder, however, reported a gain in weight

from 1 to 65 pounds (1 to 29.5 kg) for women and 2 to 60 pounds (1 to 27.2 kg) for men, with a mean weight increase of 16 pounds (7.3 kg). Of those who gained weight during the follow-up period, 18% of the men and 23% of the women also lost weight either in pursuit of their original goal or in an attempt to lose weight gained after the program.

The average number of weeks in the program was 11; individual periods of participation ranged from one day to one year. The most frequently given reason for discontinuing participation (39% of the women and 32% of the men) was that the weekly meetings were inconvenient or posed transportation problems. The second most common reason for men was that they (21%) had achieved their goal or were close enough to work on their own. Among women, 22% claimed that they did not have sufficient motivation to continue the program.

Prediction of Weight Loss and Weight Loss Maintenance

In predicting the first of the three criteria (the ratio of weight loss achieved to desired loss during the program), the composites of Change in Health Status, History of Dieting, and Overweight History yielded a multiple R of .37 and a cross validity of .32 (as shown in Table 2). Thus, the most important distinguishing variables of the weight loss to desired weight loss ratio were the experiencing of positive health changes, few past attempts at dieting, and an adult onset of the weight problem.

For the second criterion, which included the weight losses achieved both during the regimen and throughout the follow-up period, the composites of Change in Eating Behaviors, Change in Health Status, and Overweight History produced a multiple R of .403 and a cross-validity of .430. These values are displayed in Table 2. The most powerful predictor of the weight loss/maintenance ratio criterion, therefore, was a self-reported improvement in one's eating behaviors. The second most important correlate was a self-appraisal of an overall positive change in one's health status. The third variable to enter the multiple R was the Overweight History composite which indicated that individuals who had become overweight as adults would be more successful than individuals who were overweight as children at achieving and maintaining the desired weight loss goal.

Also shown in Table 2 are the results for predicting the third criterion or the rating of success in the program and throughout the follow-up period. The multiple R of .306, which cross validated at .264, included the composites of Change in Eating Behaviors, Feelings while Dieting, and Activities. That is, the more successful participants were those who experienced a positive change in their eating behaviors, reported favorable feelings while in the program, and engaged in some form of physical activity before and during the program.

Table II. Correlation Coefficients and Beta Weights between Composites and Three Weight Loss Criteria for Participants in a Navy-sponsored Weight Reduction Program (N = 686)

Composite	r	Beta Weight	Multiple R	Cross-Validity
Criterion 1: Ratio of Program Weight Loss to Desired Weight Loss			.372	.317
Change in Health Status	.272	.240		
History of Dieting	.252	.204		
Overweight History	.189	.117		
Criterion 2: Ratio of Weight Loss in Treatment and Follow-up to Desired Weight Loss			.403	.430
Change in Eating Behaviors	.326	.366		
Change in Health Status	.154	.187		
Overweight History	.105	.132		
Criterion 3: Rating of Failure (1) to Success (4)			.306	.264
Change in Eating Behaviors	.237	.266		
Feelings while Dieting	.111	.151		
Activities	.104	.132		

DISCUSSION

Results of this study demonstrated that the Navy-sponsored weight reduction program, when compared with findings of similar studies based on self-reported data, was quite successful in helping participants lose weight. The mean weight losses of 22 pounds (10 kg) for women (n = 531) and 28 pounds (12.7 kg) for men (n = 155) were considerably greater than those reported by other researchers identified at the outset. More important, 32% of the women and 29% of the men responded that they had not gained weight in treatment nor throughout the follow-up period. These results, however, were not as favorable as those reported by Forsyt et al. (1982), which showed a success rate of 73% at the end of the follow-up.

Results of the regression analyses for this study identified the variables that characterized the successful dieter and the successful weight loss maintainer. For the former, the analyses determined that for those individuals who experienced the greatest success in achieving their weight loss goals, the strongest correlates included a self-reported improvement in health status while dieting, a history of few attempts at dieting, and a history of weight problems beginning in adulthood rather than childhood. In identifying variables predictive of successful weight loss maintenance during the one-year follow-up, other factors entered the regression equation, the most important being that of a change in eating behaviors. On the basis of these results, the successful maintainer was characterized as having: (1) adaptively altered his or her eating behaviors, (2) experienced few adverse health changes or negative feelings while dieting, (3) become overweight during adulthood, and (4) engaged in some form of physical exercise.

In acknowledging behavioral change as the most powerful predictor of weight loss maintenance and that the other correlates also are readily applicable to a behavioral analysis, the results of this study can be examined within such a framework. First, the majority of diet programs are aversive to the dieter if a weight loss goal is to be achieved. In other words, the dieter is required to restrict, often quite abruptly, a highly desirable, immediately reinforcing stimulus (food) while substituting a nonimmediately reinforcing, often nebulous long-term goal of weight loss. Faced with a choice of either an immediate, powerful reward (satiety and the numerous social reinforcers associated with food) or the significant, yet long-term and unfamiliar, goal of improved health benefits or increased physical attractiveness, few individuals can exert the "will power" to choose the latter. Indeed, any success achieved with most diets is as temporary as the diet itself, for the dieter has only altered his or her eating habits for a brief period. To maintain a weight loss over the long term, appropriate eating behaviors must permanently replace inappropriate ones.

Second, individuals who reported an improvement in their health status and few negative feelings while dieting had a greater likelihood than others of achieving and maintaining their weight loss goal. Feelings of physical and mental well-being no doubt served as reinforcing feedback which in turn provided an impetus for continuing the program in pursuit of the weight loss goal. This finding is extremely important because one of the most pervasive themes in the literature concerning self-help groups is the necessity for continued participation. An initial step in encouraging participants to remain in a program is to extirpate the concepts of will power and motivation from weight loss programs. Both imply weakness on the part of the individual and provide ready-made excuses for failure, while neither suggests any specific behavioral means of redress. Instead, techniques should be employed to actively induce positive feelings toward weight loss and the program. Cognitive-behavioral modification strategies (Mahoney, 1974; Meichenbaum, 1977), which typically combine specific behavioral training with cognitive restructuring, have been shown to be effective in maintaining behavior over time. The use of such techniques, especially those that alter internal dialogues (e.g., the changing of negative self-talk to positive) has been deemed important in efficacy and outcome expectations (Bandura, 1977) as well as with a number of health-related conditions (Kaplan, 1982). Hence, success can be explained by permanent adaptive behavioral transformation, and a long-term alteration is most likely to evolve by repeated exposure to a change-inducing stimulus (e.g., group support).

Another important correlate of weight loss achievement was a history of few diet attempts, which can be explained by examining past learning. In conjunction with the punishing loss of significant rewards, an uncomfortable void is created during the weight loss regimen which the dieter seeks to fill with other reinforcing stimuli. This phenomenon explains why smokers attempting to quit often gain weight, and weight losers who smoke often increase their number of cigarettes. Because diets are aversive, the obese come to perceive dieting and weight loss as unpleasant and perhaps even painful; repeated failures lower self-efficacy and contribute to feelings of hopelessness. Eventually, imagining oneself as thin may become aversive, too. Thus, the experiencing of few dieting attempts is associated with a greater likelihood of weight loss achievement.

Other results of this study showed that age at onset of obesity was significantly associated with weight loss achievement and maintenance. The findings suggested that childhood onset of obesity tends to predestine individuals to an adulthood of weight control problems whereas those who gain weight as adults have a greater likelihood of successfully losing weight and maintaining the loss. In interpreting these results, the issue of the contribution of genetics and metabolic defects to the etiology of obesity should be raised, even though the nature-nurture controversy continues to be unresolved and, therefore, cannot be adequately discussed. A more critical consideration is the effect of age at onset of obesity on treatment and follow-up outcome which implies that different weight reduction programs may have to be developed to provide the most effective regimen for both groups. For example, a highly structured weight loss program requiring a refundable fee, a strict adherence to a reinforcement contingency plan, and participation in numerous nonfood-related activities might prove more beneficial to individuals who became obese as children than those who experienced an adulthood onset of obesity. Future research endeavors must be directed to the solution of the best form of treatment for the individual; such efforts would help to reduce the detrimental effects of numerous dieting attempts to lose weight.

Finally, most researchers (Mayer, 1968; Stuart & Davis, 1972; Davis, 1974) concur that obesity is caused by an imbalance in the number of calories ingested and the number of calories expended through physical activity. Because an inverse proportion would result in weight loss, most diet regimens are enhanced by a properly tailored exercise program (Miller & Sims, 1981). Such programs, moreover, may assume a role in filling the void once occupied by eating or food-related activities. Another benefit for the dieter is that moderate exercise tends to suppress appetite (Mayer, 1968; Thompson et al., 1982) and partially offset decreases in metabolic rate caused by reduced food intake (Scheur & Tipton, 1977; Wooley et al., 1979). Further, sustained periods of exercise contribute to improved physical, physiological, and psychological conditions that of themselves are reinforcing.

Because most dietary treatments have been relatively ineffective for long-term weight loss maintenance, techniques need to be identified that guarantee a higher probability of success. In noting that most overweight individuals simply eat too much and exercise too little, the obvious solution is that more adaptive behaviors must be substituted for the status quo. A successful long-term change in one's eating behaviors requires a systematic introduction of competitive, nonfood-related reinforcers that hold significance for the dieter to first bridge the gap and then slowly fill it. Particularly among the chronically obese, a behavioral change is a prerequisite for attitudinal change, as these individuals have had much practice at parrying extraneous attempts at changing their attitudes toward obesity. Efficacious, cost-effective, individualized intervention procedures suitable for group settings in both the military and nonmilitary communities must be developed that incorporate an exercise regimen and promote the adoption of a long-term nutritionally sound eating program.

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FOOTNOTES

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Results showed that a Navy-sponsored weight reduction program was relatively successful in helping participants lose weight during treatment and throughout a one-year follow-up. Of the 531 women and 155 men who reported a mean weight loss of 22 pounds and 28 pounds, respectively, 32% of the women and 29% of the men responded that no weight had been gained during treatment and follow-up. Regression analyses identified predictors of weight loss to be a self-reported improvement in health status, a history of few dieting attempts, and adult onset of obesity. Correlates of weight loss maintenance included

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a change in eating behavior, a self-reported improvement in health status and feelings toward dieting, adult onset of obesity, and physical exercise participation. Such results pointed up the importance of developing an intervention program that incorporates an exercise regimen and the adoption of a long-term nutritionally sound eating program.

SUMMARY

Problem

Despite the perennial concern about weight reduction, the goal of losing weight and maintaining a weight loss remains an elusive one for most individuals. The U.S. Navy has become increasingly more involved in the implementation of effective weight reduction programs not only because of the necessity for maintaining high levels of health and physical fitness established for all active duty personnel but also because of its responsibility to provide health care for retirees and dependents. Obesity has been linked with at least eight specific disorders, the consequences of which are an increased likelihood of ill health among the obese and a corresponding decrease in naval readiness, a heavier work load for Navy physicians, and the added responsibility among health care specialists for developing and conducting weight reduction programs.

Objectives

The purpose of this longitudinal study was (1) to evaluate the effectiveness of a Navy-sponsored weight reduction program in helping participants lose weight and maintain the weight loss during a one-year follow-up and (2) to identify variables predictive of success during treatment and throughout the follow-up period.

Approach

Participants included 268 active duty or retired naval men and 923 women (nearly all of whom were spouses of naval personnel) enrolled in a Navy-sponsored weight reduction program. After a one-year follow-up, an evaluation form was mailed to all participants, except for 200 individuals who could not be located. Responses to the survey (686 participants or 58% returned the questionnaire) were used to create three criteria: the ratio of weight loss to desired weight loss goal during the program, the ratio of pounds lost in the program and during follow-up minus pounds gained divided by desired weight loss goal, and a rating of success from 1 to 4, with 1 representing "didn't really diet" to 4 for achieving the weight loss goal. Nine composites of items from the pretreatment and follow-up questionnaires were used as predictors of the three criteria after dividing the sample into validation and cross-validation subsamples.

Results

Results of this study demonstrated that the Navy-sponsored weight reduction program was quite successful in helping participants lose weight; the mean weight loss was 22 pounds for women and 28 pounds for men. By the end of follow-up, 32% of the women and 29% of the men responded that they had not gained weight.

In predicting the ratio of weight loss achieved to desired weight loss during treatment, the strongest correlates among the nine composites included a self-reported improvement in health status while dieting, a history of few attempts at dieting, and adult onset of obesity. For the two criteria of one-year weight loss maintenance, the successful maintainer was characterized as having: (1) adaptively altered his or her eating behaviors, (2) experienced few adverse health changes or negative feelings while dieting, (3) become overweight during adulthood, and (4) engaged in some form of physical exercise.

Conclusions

Results showed that to maintain a weight loss over the long term, appropriate eating behaviors must permanently replace inappropriate ones. Second, individuals who reported an improvement in health status and few negative feelings while dieting had a greater likelihood than others of achieving and maintaining their weight loss goal. Third, the experiencing of few dieting attempts was associated with weight loss achievement and maintenance. Other results suggested that childhood onset of obesity tends to predestine individuals to an adulthood of weight control problems. Fifth, because obesity is caused by an imbalance in the number of calories ingested and the number expended, most diet regimens are enhanced by a properly tailored exercise program.

Recommendations

Weight reduction programs need to be identified that guarantee a higher probability of success than that reported for most programs. A successful long-term change in one's eating behaviors requires a systematic introduction of competitive, nonfood-related reinforcers that hold significance for the dieter to first bridge the gap and then slowly fill it. Efficacious, cost-effective, individualized intervention procedures suitable for group settings in both the military and nonmilitary communities must be developed that incorporate an exercise regimen and promote the adoption of a long-term nutritionally sound eating program.